

NON-PUBLIC?: N
ACCESSION #: 8906050228
LICENSEE EVENT REPORT (LER)

FACILITY NAME: PLANT VOGTLE - UNIT 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000424

TITLE: REACTOR TRIP DUE TO LIGHTNING STRIKE
EVENT DATE: 07/31/88 LER #: 88-025-02 REPORT DATE: 05/30/89

OPERATING MODE: 1 POWER LEVEL: 016

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.79(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: R.M. ODOM, NUCLEAR SAFETY COMPLIANCE MANAGER
TELEPHONE: (404)826-3201

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: AA COMPONENT: RJX MANUFACTURER:
REPORTABLE TO NPRDS: N

CAUSE: C SYSTEM: AA COMPONENT: ECBD MANUFACTURER:
REPORTABLE TO NPRDS: N

CAUSE: B SYSTEM: IA COMPONENT: CBD MANUFACTURER:
REPORTABLE TO NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 7-31-88, at 2014 CDT, lightning struck the Containment building and a reactor trip occurred. The Main Feedwater System was isolated and the Auxiliary Feedwater system actuated. Control room personnel responded in accordance with plant procedures.

An investigation revealed that the electrical surge from the lightning strike shutdown the output of the Control Rod Drive Mechanism power supplies, allowing the rods to drop into the core, as designed. Several other plant systems were affected by the lightning strike but these had no major impact on plant operations. Corrective action included performance of an evaluation of the plant surge protection which recommended the installation of surge

suppressors in the rod control power circuits.

END OF ABSTRACT

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A. REQUIREMENT FOR REPORT

This report is required per 10 CFR 50.73(a)(2)(iv) because an unplanned actuation of the Reactor Protection System occurred.

B. UNIT STATUS AT TIME OF EVENT

At the time of this event, Unit 1 was in Mode 1 (Power Operations) at 16% rated thermal power. There was no inoperable equipment which contributed to the occurrence of this event.

C. DESCRIPTION OF EVENT

On July 31, 1988 at 2014 CDT, the control room operators observed a flash on the Emergency Response Facility (ERF) Computer screens, a blink of the control room overhead lights, and a subsequent automatic reactor trip. Control rods inserted and an annunciator indicated the reactor trip was the result of the nuclear instrumentation system sensing a high flux rate power range excursion (negative rate). The Main Feedwater system was isolated and the Auxiliary Feedwater system actuated. Control room personnel responded appropriately and in accordance with plant procedures. Eyewitnesses contacting the control room reported that lightning had struck the low voltage switchyard and the containment building, then spread to various other power block buildings. No fires or obvious lightning damage were noticed. However, immediately after the lightning strike, the ERF computer became inoperable and the Security system primary computer and the Fire Protection system computer alarmed. There were no abnormal control room indications during the plant shutdown except that a low pressurizer pressure bistable spuriously alarmed.

After this event, an investigative team was formed and began troubleshooting. Several items were reviewed. One of these items attempted to find a correlation between the lightning strike and the failed components, specifically, the nuclear instrumentation system. It was speculated that the reactor trip was caused by a disturbance in the nuclear instrumentation, creating a spike and providing a simulated high negative flux rate. However, no correlation was found. Based on these findings, an attempt to move control rods was made to verify rod operability with no response by the Control Rod Drive Mechanism (CRDM). Therefore, troubleshooting of the CRDM and associated logic cabinets

began. The effort revealed that the electrical surge from the lightning strike had caused the CRDM positive 24 volt DC and negative 24 volt DC power supplies to automatically shut down.

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These power supplies are designed to shut off their output whenever an excessive output voltage is sensed, and cannot be reset without first de-energizing the input, then re-energizing the input. All power supplies in the CRDM power supply cabinets were reset. Loss of these power supplies had caused power interruption to the CRDM thyristors, allowing the rods to drop into the core. After resetting the CRDM power supplies and replacing a Supervisory Logic III card (which was damaged as a result of the lightning strike), a control rod operability test was performed, and the rods responded as designed.

During the CRDM troubleshooting, a 100 volt DC power supply in the logic cabinet was found to be defective and was replaced. This power supply is auctioneered with another redundant 100 volt DC power supply, and therefore, it did not have any effect on this event.

Additionally, when the primary Security system computer shutdown, the back-up computer exhibited perturbations, but these did not affect system operability. They were caused by a circuit board which was apparently defective prior to the lightning strike.

On August 1, 1988, prior to beginning restart of the unit, the containment building was visually inspected for lightning damage (burn marks, lightning rods and ground wire integrity, etc). The main generator controls were checked. The ERF, Security, and Fire Protection computers were verified operable. Visual inspections were performed in the unit protection cabinets (Process Control System and Solid State Protection System), to verify no power supplies were damaged. On August 2, 1988, the low pressurizer pressure instrumentation channel was tested and shown to be operable. In addition, a Solid State Protection system operability test was performed on August 9, 1988, and revealed no problems.

On August 11, 1988, an inspection found that the Containment Building

lightning protection did not meet design criteria because only one down conductor had been connected to the station ground grid. However, it is not believed that this condition contributed to the severity of this event because the existing down conductor was found to be undamaged after this event and should have grounded any lightning strikes experienced.

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D. CAUSE OF EVENT

The cause of this event is attributed to a lightning strike which resulted in an electrical surge in several plant areas which caused computers to shut down, CRDM power supplies to shut down, and a subsequent reactor trip. Although the plant had experienced several lightning strikes in the past with minimal effects, this strike resulted in induced electrical currents which effected other systems.

E. ANALYSIS OF EVENT

Immediately after the reactor trip, the Main Feedwater Pump A was manually tripped (Pump B was already tripped), which in turn initiated an automatic start of the A and B Train Motor Driven Auxiliary Feedwater Pumps. The reactor trip breakers opened, main steam isolation valves closed, and the main generator tripped as designed. Based on these considerations, it is concluded that there was no adverse effect on plant safety or public health and safety as a result of this event. Because safety systems performed as designed, the results of this event would not have been more severe had it occurred at a higher power level.

F. CORRECTIVE ACTIONS

1. A 100 volt DC power supply and a supervisory logic card were replaced in the CRDM system.
2. A circuit board was replaced in the security system back-up computer.
3. The Containment Building lightning protection was inspected for damage and found to be satisfactory.
4. The ERF computer, Fire Protection computer, low pressurizer pressure instrumentation channel, main generator controls, Process Control system and Solid State Protection system were checked and found to be operable.
5. A re-evaluation of the plant's lightning surge protection was performed and a determination made to install surge suppressors in the rod control power circuits. This installation was completed by November 15, 1988.
6. The down connectors on the containment building are being redesigned in order to minimize induced current, and to minimize raising the potential in localized areas of the ground grid. This is scheduled to be completed and installed by 9-1-89.

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G. ADDITIONAL INFORMATION

1. Failed Components

a) CRDM 100 volt DC Power Supply manufactured by Westinghouse Electric. Part #LMCC100

b) CRDM Supervisory Logic Card manufactured by Westinghouse Electric. Part #3360C80G01

c) Security computer circuit board manufactured by Computrol. Part #30-0056-1-1 TYPE: CDC Common Logic II

2. Previous Similar Events None

3. Energy Industry Identification System Code:

Control Rod Drive System - AA

Main Feedwater System - SJ

Auxiliary Feedwater System - BA

Containment Building - NH

Main Generator System - TB

Fire Protection System - KP

Security System - IA

Switchyard System - FK

Solid State Protection System - JG

Reactor Coolant System - AB

Process Control System - JC

Emergency Response Facilities - NC

ATTACHMENT 1 TO 8906050228 PAGE 1 OF 1

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PLANT VOGTLE - UNIT 1
NRC DOCKET 50-424
OPERATING LICENSE NPF-68
LICENSEE EVENT REPORT
REACTOR TRIP DUE TO LIGHTNING STRIKE

Gentlemen:

In accordance with 10 CFR 50.73, Georgia Power Company hereby submits a Licensee Event Report (LER) revision. Corrective Action #6 discusses the installation of down conductors on the containment building. Due to unexpected delays in the installation process, the implementation date must be revised from 6-1-89 to 9-1-89.

If you have any questions in this regard, please contact this office.

Sincerely,

W. G. Hairston, III

TEW/NJS/gm

Enclosure: LER 50-424/1989-025-02

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*** END OF DOCUMENT ***
